CHAPTER 9
APPLICATION TO NAVIGATION STRUCTURES

9-1. General. Grouting for navigation structures is ordinarily performed prior to, or during, the original construction to improve the foundation or reduce seepage and uplift pressures. Remedial grouting under slabs or foundations may also be required after construction as well as for wall repair applications. The application of foundation grouting would be similar to that described for dams in chapter 7.

9-2. Foundation Treatment. The mass strength and permeability of the soil or rock of the foundation on which the structure is founded may require preconstruction improvement or subsequent remedial work. Treatment may be required both for permanent work as well as temporary structures such as cofferdams. These improvements may be achieved by using various types of applications involving the injection of cement or chemical grouts or both. A laboratory evaluation of the materials planned for use in the treatment is recommended, followed by onsite injection tests and core recovery from injected areas. Structures suffering foundation erosion can be grouted with the conventional equipment and materials frequently used in grouting large voids. Special consideration should be given to the ability of the grout to seek its own level, the bonding properties of the grout injected into areas of exposed piling so as not to increase the dead weight of the structure, and the rate of flow of the water in the area to be grouted. Parts of chapters 7 and 10 of this manual describe various applications for foundation improvements. EM 1110-2-3504 is a recommended reference, as well as "Consolidation Grouting at an Existing Navigation Lock," by Neff, Sager, and Griffiths.

9-3. Repairs. Wall, slab, apron, and foundation repair of navigation structures is often necessary. Special grouting applications are frequently required.

a. Vertical Concrete Walls. Cracks may develop and horizontal and vertical construction joints may become highly permeable in vertical concrete walls. Grouting methods are described in EM 1110-2-2002. Natural weathering, mainly freezing and thawing, often results in cracking and spalling; barge traffic through locks also generally results in severe abrasion not only in the upper section of guide walls but also of the main lock walls. Repairs may be made by injecting water-insensitive epoxies. Repair of large cracks may be accomplished by using fine, dry sands as a filler in epoxies. Spalled areas located on vertical walls often require forms to retain either a portland cement grout or an epoxy/sand grout. Special epoxies are formulated for use in much patching work. As a result of advanced epoxy technology, a great variety of epoxies are available for specific job requirements, such as injectivity into dry or wet cracks and bond of old concrete or grout to new grout. A method of repairing areas severely abraded by barge traffic involves placing steel armor plates over the abraded areas by anchor bolting, sealing the bottom and end edges by caulking, and injecting portland cement grout through

grouting nipples that are located near the bottom of the armor plate. This grouting operation is conducted in compartmentalized sections provided between the armor plate and the concrete face. For additional information on vertical wall repairs, refer to WES TR C-78-4 and WES Translation No. 65-4 (app A).

b. Slab and Apron Crack Repair. Repair for navigation structures is conducted using epoxies and portland cement grout applications. The WES publication, "Maintenance and Repair Practices for Pavements, Facilities Engineers," is a recommended reference.

c. Filling voids under slabs and aprons and stabilizing and jacking slabs are covered in paragraph 11-3d and e.

9-4. Grout Curtain Through the Lock Area. Conditions in the foundation of locks will in many cases require the placement of a grout curtain. The method of placement of such curtains is generally the same as that for curtains placed in the foundations of concrete dams. The emplacement of these curtains is described in detail in paragraph 7-1. The grouts used in these curtains may be either portland cement, chemical, or both.